Sketching "Area Functions"

Example :

Let $f(t) = 2t - 2$ on the interval [-2 , 4] and define $A(x) = \int_0^x (2t-2)dt$

a. Sketch a graph of **f** on the given interval.

b. Using your graph of **f**, sketch the graph of **A** on the same interval. (Note: The **y-value** of a point (x , y) on function **A** represents **area** in the graph of f from $t = 0$ to $t = x$.)

c. Verify your sketch in **part b** above by graphing $y = A(x)$ using **fnint** on your calculator.

d. Analytically, "guess" the rule for the function $y = A(x)$. Be sure to look at the important parts of the graph!

$A(x) =$ _____

e. Use the **Fundamental Theorem of Calculus** to derive the actual function for **A**.

f. How good was your guess?

Complete steps **a** through **f** above for the following functions on the given intervals. Be sure to answer all questions!

1. $f(t) = 3$ on [-2 , 3] and $A(x) = \int_0^x 3dt$

2. $f(t) = \frac{1}{2}t$ on [-2 , 3] and $A(x) = \int_1^x \frac{1}{2}t\,dt$

3. $f(t) = -t + 2$ on [-1 , 5] and $A(x) = \int_0^x (-t+2)dt$

4. $f(t) = t^2 - 2t$ on [-2 , 3] and $A(x) = \int_{-1}^x (t^2 - 2t)dt$

5. $f(t) = 4\sin 2t$ on [$-\pi$, 2π] and $A(x) = \int_0^x 4\sin 2t\,dt$

Note: The amplitude of f is _____ and the period of f is _____

Answer the following questions about the relationship between the function **f(t)** and $A(x) = \int_a^x f(t)dt$.

1. What is the value of **A(a)**? _____

2. A point on **A** where a **maximum** or **minimum** occurs is a _____ of **f**.

3. An **inflection point** on **A** occurs at a _____ of **f**.